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NOTES ON CHIROPTERA.

BY GLOVER M. ALLEN.

WITH ONE PLATE.

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No. 3. — *Notes on Chiroptera.* By GLOVER M. ALLEN.

THE collection of bats in the Museum of Comparative Zoölogy contains upwards of 190 species, represented by skins, skeletal parts, and alcoholic specimens. Many of these specimens are of unusual interest. I have made the following notes while studying this material recently. In the case of certain imperfectly known species detailed series of measurements or other data of interest are given, and five species are described as new.

Of especial note are the collections received from the Thayer Expedition to Brazil, made in 1865, under the direction of Louis Agassiz; also a considerable number of Indian bats sent at about the same time by Rev. M. M. Carleton from northern India and the Koolloo Valley. More recently a valuable series of alcoholic specimens from Java and Japan was presented by Mr. Thomas Barbour, in part collected by himself in 1906-07. I am indebted to the authorities of the Museum of Comparative Zoölogy for the privilege of making this report, and to the United States National Museum, through Dr. M. W. Lyon, Jr., for the loan of certain specimens.

All measurements are in millimeters, and colors are after Ridgway's Nomenclature of colors. I have followed the nomenclature and order adopted by Miller in his monograph on "The families and genera of bats" (Bull. 57, U. S. Nat. Mus., 1907).

PTEROPIDAE.

Cynopterus brachysoma DOBSON.

The collections of Mr. Thomas Barbour establish for the first time, apparently, the occurrence of two species of *Cynopterus* in the island of Java. The larger of these is clearly the *Pteropus titthaechilus* of Temminck, noticed below; the smaller species is represented by five adult females and four immature specimens, all from Buitenzorg. These I have with some hesitation referred to *Cynopterus brachysoma* of Dobson, with the description of which they closely agree, notwith-

standing that the type came from Southern Andaman Island. All the specimens show the small lobe at the inner base of the outer margin of the ear, which Dobson believed to be characteristic of his species. The margin of the ear is edged with whitish, though in some specimens this is apparent on the inner margin only. The fingers also are whitish on both superior and inferior surfaces. This bat is probably closely related to *C. scherzeri* of the Nicobar Islands, but is clearly smaller and with a different skull. It approaches nearest to *C. montanoi*, but differs in numerous minor details if one may judge by the description. Should it eventually prove that the Javan animal is distinct from *C. brachysoma* of the Andaman Islands, it is probable that Gray's name, *horsfieldi*, would be available for it, although his description applies almost as well to *C. titthaecheilus*, save in the forearm length, which is given as "2½ inches?" (= 64 mm.). The following are the measurements of four adult females from Buitenzorg, Java, and for comparison, Dobson's measurements (converted into millimeters) of the type of *C. brachysoma* from Southern Andaman Island are added.

MEASUREMENTS OF CYNOPTERUS BRACHYSOMA.

No.	Head and Body.	Tail.	Ear.	Fore-arm.	Second Digit.	Third Digit.	Fifth Digit.	Tibia.	Foot.
Dobson	74.0	6.4	15.0	55.5	—	101.5	76.0	20.3	13.0
6943	78.7	9.5	16.0	61.0	42.0	98.0	77.0	20.0	14.0
6945	83.0	8.7	17.0	62.0	43.5	103.8	78.3	21.0	14.5
6946	74.0	8.7	15.0	63.0	43.0	105.5	81.0	21.4	14.5
6947	81.5	7.3	16.5	61.5	40.0	97.0	78.5	21.3	12.0

It will be seen that Dobson's specimen had a slightly shorter forearm than the Javan ones, but the other dimensions seem to be about the same.

The following cranial measurements are taken from the skull of No. 6946: greatest length, 29.3; basal length, 26; interorbital constriction, 6.2; zygomatic breadth, 19; mastoid breadth, 12; mandible, 22; maxillary tooth row (exclusive of incisors), 10; mandibular tooth row (exclusive of incisors), 11.

Cynopterus titthaecheilus (TEMMINCK).

Four adults of both sexes, and one immature female, were taken at Buitenzorg, Java, by Mr. Thomas Barbour. As shown by Miller (Proc. U. S. Nat. Mus., 1903, vol. 26, p. 474) this is doubtless the type locality, as Temminck gives the habitat of this species as "les îles de Java et de Sumatra" and mentions "une grande quantité de sujets capturés à Buitenzorg." Mr. Miller's series of bats

from Sumatra is stated to show no indication of a whitish border to the ears, but this character is plainly present in the alcoholic specimens obtained by Mr. Barbour in Java, and is mentioned also by Temminck. A Javanese specimen skinned out from alcohol agrees well in color with that described by the latter.

MEASUREMENTS OF CYNOPTERUS TITTHAECEILUS.

No.	Total Length.	Tail.	Ear.	Fore-arm.	Thumb.	Second Digit.	Third Digit.	Fifth Digit.	Tibia.	Foot.
6934	115.0	11.5	20	78.5	33	53.5	128	100	31.0	19.0
6935	117.5	10.0	21	78.5	33	53.0	130	97	34.0	18.6
6936	118.0	9.0	21	79.0	33	53.0	130	102	31.3	18.0

In his original description, Temminck gives the following measurements (here converted into millimeters): total length, 127; forearm, 76; distance from anterior corner of eye to tip of nostril, "7 lignes," or about 15.5. The forearm measurement corresponds closely with that of our specimens, which are evidently larger than those from Sumatra referred by Mr. Miller to this species. It seems probable that the Sumatran bat is distinct.

The following cranial measurements are from the skull of an adult male, No. 6937, from Buitenzorg, Java: greatest length, 36; basal length, 32; inter-orbital constriction, 6.5; zygomatic breadth, 23.8; mastoid breadth, 14; mandible, 28; maxillary tooth row (exclusive of incisors), 12.7; mandibular tooth row (exclusive of incisors), 14.

The collection also contains a mounted specimen labelled "Borneo," whose thumb and (dried) ear are smaller, but otherwise it is practically identical with this species. Its range may eventually be found to be more extensive than at present supposed.

Ptenochirus lucasi (DOBSON).

Two alcoholic specimens from Sarawak, Borneo, agree well with the characters given by Dobson.

Rousettus collaris (ILLIGER).

Two specimens, Nos. 6748, ♀, 6749, ♂, from Cairo, Egypt, seem to be this species rather than *R. aegyptiacus*, and probably indicate nearly the northern limit of its range. They are preserved in alcohol, and measure as follows: tail, 13, 15.5; ear from crown, 18, 18; forearm, 93, 95; thumb, 35, 35; 2d digit, metacarpal, 47, 44.5; 1st phalanx, 9, 10; 2d phalanx, 10, 9.4; 3d digit, metacarpal, 62, 62; 1st phalanx, 41, 42; 2d phalanx, 56.4, 57.7; 4th digit, meta-

carpal, 61.5, 60; 1st phalanx, 32.3, 31; 2d phalanx, 37.5, 36.5; 5th digit, metacarpal, 60, 59; 1st phalanx, 30, 29; 2d phalanx, 29, 27.5; tibia, 41, 40.6.

***Pteropus ariel*, sp. nov.**

Type.—Adult male (skin and skull), No. 10,565, Museum of Comparative Zoölogy; collected at Male Atoll, Maldive Archipelago, by H. B. Bigelow, A. Agassiz Expedition, December 24, 1901.

General Characters.—Color essentially as in *Pteropus giganteus* (Brünn.), but size smaller; rostrum much blunter and shorter, with a consequent crowding of the cheek teeth.

Color.—Skin of face, muzzle, and chin black, thinly clothed with black and burnt-umber hairs; throat and crown of head burnt umber, passing into ochraceous and ochre yellow on the nape and shoulders; back black, with scattered grayish hairs and posteriorly with a slight admixture of brown hairs (nearly burnt umber). Chest and abdomen ferruginous or orange rufous, becoming blackish about the anal region and on the sides of the body. Membranes and ears black.

Skull and Teeth.—Skull slightly narrower with narrower brain case and more slender zygomata as compared with Indian specimens of *P. giganteus* from the Koolloo Valley. The sagittal crest is as strongly developed and the teeth are as large as in *P. giganteus*, but the rostrum is conspicuously shorter and relatively broader, so that it does not taper as noticeably as in the continental species. In consequence of the shortened rostrum, the tooth row is also shortened and the teeth are more crowded.

Measurements.—External measurements of the type skin (measurements in parentheses are from a skin of *P. giganteus* of approximately the same age, from Koolloo Valley, India): ear, 30 (31.5); forearm, 160 (—); thumb, 63 (73.5); 2d digit, 115 (130); 3d digit, metacarpal, 105 (114); 1st phalanx, 77 (86.5); 2d phalanx, 112 (108.6); 4th digit, metacarpal, 107 (115); 1st phalanx, 64 (69); 2d phalanx, 66 (65+); 5th digit, metacarpal, 112 (119); 1st phalanx, 45 (52); 2d phalanx, 52 (54); tibia, 74 (—); foot, 41 (47).

Cranial measurements of the type (and in parentheses those of an adult from Koolloo Valley, India): greatest length, 66 (—); basal length, 63 (—); inter-orbital constriction, 8 (8); zygomatic breadth, 36.7 (40.8); mastoid breadth, 21.4 (22); palatal notch to incisive foramen, 31 (36.4); mandible, 54 (56.5); maxillary tooth row (exclusive of incisors), 25.3 (28.3); mandibular tooth row (exclusive of incisors), 29.3 (31).

Distribution.—So far as known, this species is confined to the Maldive Archipelago.

Remarks.—In addition to the type there is an immature female in the collection, also from Male Atoll. The sutures are still plainly visible in the skull, and a comparison with similar skulls of *P. giganteus* from Koolloo Valley, India, shows that the nasals, in addition to being much shorter, are wider in the middle, and expand less abruptly at the distal end. (See Pl. 1, Figs. 1-4.)

The peculiar short, broad rostrum, and nasal bones, correlated with the slightly more crowded tooth row, as well as the lesser size of this bat, distinguish it readily from *P. giganteus* of the Indian mainland, which is doubtless its nearest ally.

***Pteropus ualanus* PETERS.**

Specimens of this bat seem to be rare in collections, so that it is desirable to include measurements of two males, Nos. 3272, 3273, alcoholic, from Strong's Island, Caroline group: ear, 23.4, 24; forearm, 130, 126; thumb, 57, 57; 2d digit, 92, 93.5; 3d digit, metacarpal, 93, 89.5; 1st phalanx, 65, 63; 2d phalanx, 96, 91.5; 4th digit, metacarpal, 90, 88; 1st phalanx, 53.3, 53; 2d phalanx, 57.5, 55.3; 5th digit, metacarpal, 94, 93; 1st phalanx, 41, 41; 2d phalanx, 42, 39; tibia, 56, 57; foot, 34, 35.

Cranial measurements: greatest length, 62, 61; basal length, 55, 53.6; inter-orbital constriction, 7, 6.3; zygomatic breadth, 39, 35; mastoid breadth, 22, 21; mandible, 48.5, 48; maxillary tooth row (exclusive of incisors), 22.5, 22; mandibular tooth row (exclusive of incisors), 24.7, 26.

EMBALLONURIDAE.

***Emballonura nigrescens* (GRAY).**

Four specimens, collected by Mr. Thomas Barbour in Ternate, Moluccas, measure as follows:

MEASUREMENTS OF EMBALLONURA NIGRESCENS.

No.	Sex.	Total Length.	Tail.	Ear.	Fore-arm.	Third Digit.	Tibia.	Foot.
6795	♂	46.5	13.5	9.5	34.0	54.0	11.0	6.0
6796	♀	53.0	15.0	9.0	35.7	56.0	12.0	5.8
6797	♀	50.0	13.6	9.0	35.4	54.5	11.0	5.7
6798	♂	52.0	15.0	9.3	35.4	54.0	11.6	5.5

***Rhynchiscus naso* (WIED).**

As pointed out by Miller, the Old World genus *Emballonura* is the most primitive of the family, and the only one possessing two permanent upper incisors on each side. It is therefore interesting to find that in a large embryo of *Rhynchiscus naso*, from Porto Seguro, Brazil, there are 2-2 upper milk incisors, and in a series of nine adults from the same locality, three (Nos. 4212, 4217, 4219) have what appears to be a persistent upper milk incisor on the outer side of each permanent incisor. These persistent teeth are so large as to appear like functional

teeth of the permanent dentition and are very similar in size and shape to these latter. The forearm measurement of the nine adults averages about 39.5 mm. (38-41).

Peropteryx canina (WIED).

In a paper on the mammals of Margarita Island, Venezuela (Proc. Biol. Soc. Washington, 1902, vol. 15, p. 95), I referred to "*Peropteryx* sp.," a single damaged specimen collected there in 1901. The Museum has since received an alcoholic specimen, No. 6952, from the same island, and it seems to agree essentially with specimens taken by Robinson and Lyon (Proc. U. S. Nat. Mus., 1901, vol. 24, p. 159) at La Guaira, on the adjacent mainland. Its measurements are: tail, 13; forearm, 43.5; thumb, 8.5; 3d digit, metacarpal, 39.4; 1st phalanx, 11.6; 2d phalanx, 19; 4th digit, 50.3; 5th digit, 48.6; tibia, 18; foot, 7.6; calcar, 17. As the original description of *P. canina* contains no measurements of diagnostic value, the following dimensions are added, from a male specimen in alcohol taken at Rio das Velhas, Brazil (Wied's specimens were from "Brazil"): tail, 13; forearm, 39; thumb, 8; 2d digit, 34; 3d digit, metacarpal, 36; 1st phalanx, 11.3; 2d phalanx, 19; 4th digit, metacarpal, 30; 1st phalanx, 8; 2d phalanx, 8; 5th digit, metacarpal, 30.2; 1st phalanx, 9.8; 2d phalanx, 6.5; tibia, 18; foot, 7.4; calcar, 14.4. The dimensions of this Brazilian bat closely approximate those of *P. trinitatis* from Trinidad (see Miller, Bull. Amer. Mus. Nat. Hist., 1899, vol. 12, p. 180).

NOCTILIONIDAE.

Noctilio leporinus (LINNÉ).

Four alcoholic specimens, from unknown locality, show an interesting variation in the proportions of the metacarpals. In No. 6769, the second and third metacarpals are of equal length; but in the three other individuals, the second metacarpal is shorter than the third by 1, 2, and 4.7 mm. respectively.

NYCTERIDAE.

Nycteris javanica E. GEOFFROY.

A fine series of this species was procured by Mr. Thomas Barbour, from shallow limestone caves near Buitenzorg, Java. Both sexes were found together in the caves, as well as numbers of immature bats whose pelage is uniformly smoky, instead of with the yellowish tint of the adults. An adult female, alcoholic, No. 6810, measures as follows: total length, 120; tail, 64; ear, 26.7; forearm, 49.5; thumb, 17.5; 2d digit, 43; 3d digit, metacarpal, 35.5; 1st phalanx, 24; 2d phalanx, 27.2; 4th digit, metacarpal, 40.3; 1st phalanx, 13.5; 2d phalanx, 12.2; 5th digit, metacarpal, 42; 1st phalanx, 14.5; 2d phalanx, 13; tibia, 23; foot, 11.3; calcar, 20.5. The forearm measurement of eight adults averages about 48.2 mm. (47-49.5).

Nycteris aethiopica luteola THOMAS.

This recently described race from British East Africa is "slightly larger" than typical *N. aethiopica*; and as but three external measurements are given by Thomas (Ann. Mag. Nat. Hist., 1901, ser. 7, vol. 8, p. 30), I append the following measurements of an alcoholic male, No. 3859, and female, No. 3860, both from Zanzibar: tail, 56, 56.8; ear, 27, 29; forearm, 49, 50.5; thumb, 14.6, 15.8; 2d digit, 39, 39; 3d digit, metacarpal, 36.5, 39; 1st phalanx, 25, 25; 2d phalanx, 23.8, 26.5; 4th digit, metacarpal, 49, 42; 1st phalanx, 15, 14.3; 2d phalanx, 11.3, 11.5; 5th digit, metacarpal, 41.3, 44; 1st phalanx, 13, 13.5; 2d phalanx, 12, 13; tibia, 22, 22.6; foot, 11, 11.5; calcar, 19, 18.7. Another Zanzibar specimen is mentioned by Thomas as the one referred by Dobson (Proc. Zool. Soc. London, 1879, p. 718) to *N. aethiopica*.

MEGADERMIDAE.**Megaderma trifolium** E. GEOFFROY.

Two adult males and two adult females were collected by Mr. Thomas Barbour at Tjibodas, Java, in a deep cave called Tjibureum. This cave is at an altitude of about 4000 feet on the slopes of the volcano Pangarango, and it is here that the specimens of *Megaderma* from this portion of Java are taken, as the species seems to be local in its distribution. The Museum has also a fifth Javan specimen presented by Mr. Alexander Agassiz some years ago. As the differences in size are very slight, that Andersen and Wroughton (Ann. Mag. Nat. Hist., 1907, ser. 8, vol. 19, p. 120) have pointed out as characteristic of the Javan animal, it is of value to give the dimensions of those in the Museum collection.

MEASUREMENTS OF MEGADERMA TRIFOLIUM.

No.	Head and Body.	Ear.	Fore-arm.	Second Digit.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Nose leaf.	Sex.
5980	64.5	37.0	54.5	47.4	96.0	75.0	30.5	16.0	12.0	♂
6791	66.0	33.5	55.7	48.0	100.0	78.5	28.3	16.0	12.0	♂
6792	65.8	36.4	57.0	51.5	101.0	80.0	30.0	16.3	13.0	♂
6793	64.5	35.0	57.0	50.0	104.4	82.3	29.0	16.7	12.4	♀
6794	70.0	34.0	58.6	52.0	105.5	82.0	28.3	17.0	12.0	♀

Lavia frons (E. GEOFFROY).

Two specimens of this genus from Zanzibar seem referable to *L. frons* rather than *L. rex*. Both are males, in alcohol, Nos. 1138, 1139. In the former the

secondary lobe of each tragus has three distinct serrations distally, while in the latter these lobes are practically entire, though with a slight indication of a tooth near the tip. This character is thus probably an individual variation as suggested by Miller (Proc. Biol. Soc. Washington, 1905, vol. 18, p. 228).

RHINOLOPHIDAE.

Rhinolophus ferrum-equinum regulus ANDERSEN.

Four skins with skulls, collected by the Rev. M. M. Carleton, in the Koolloo Valley, India, correspond more nearly with this race than with the neighboring allied races *tragatus* or *proximus*.

Rhinolophus acuminatus PETERS.

An adult female, No. 6868, in alcohol, was collected by Mr. Thomas Barbour at Buitenzorg, Java, and presents the following measurements: total length, 81; tail, 26.5; ear, 18.7; forearm, 48.4; thumb, 10; 2d digit, 38; 3d digit, metacarpal, 35.7; 1st phalanx, 15.4; 2d phalanx, 19; 4th digit, metacarpal, 37; 1st phalanx, 10; 2d phalanx, 12.7; 5th digit, metacarpal, 37; 1st phalanx, 11.8; 2d phalanx, 14; tibia, 20.3; foot 8.5, calcar, 13.

Rhinolophus cornutus TEMMINCK.

Four specimens, in alcohol, from Mt. Fuji, Japan, were presented by Mr. Thomas Barbour. As there are but few published measurements of this species, the dimensions of these four are here given:

MEASUREMENTS OF RHINOLOPHUS CORNUTUS.

No.	Sex.	Total Length.	Tail.	Ear.	Fore-arm.	Thumb.	Second Digit.	Third Digit.	Fifth Digit.	Tibia.	Foot.
6925	♀	—	16.0	15.0	41.5	8.4	32.0	58.5	51.0	17.3	8.5
6926	♂	55	18.4	16.5	40.0	7.4	30.0	56.0	51.8	16.0	7.5
6927	♂	59	19.0	16.8	40.0	8.0	32.6	59.0	54.0	16.4	8.0
6928	♂	58	18.5	16.5	39.0	7.6	31.5	59.0	53.0	17.0	7.5

Rhinolophus euryotis TEMMINCK.

This, the only species of the genus known from Amboina, Moluccas, is represented in the collection by a series of nine alcoholic specimens, collected by Mr. Thomas Barbour. The forearm measurement of these specimens averages about 57.4 mm. (56-58).

HIPPOSIDERIDAE.

Hipposideros diadema (E. GEOFFROY).

An adult female from Sarawak, Borneo, No. 5979, alcoholic, measures as follows: head and body, 84; tail, 52; ear, 26.7; forearm, 84.5; thumb, 14.5; 2d digit, 66; 3d digit, metacarpal, 64; 1st phalanx, 29; 2d phalanx, 32; 4th digit, metacarpal, 61; 1st phalanx, 20; 2d phalanx, 17; 5th digit, metacarpal, 56.3; 1st phalanx, 21; 2d phalanx, 20; tibia, 33; foot, 14.3; calcar, 21. Skull: greatest length, 33.5; basal length, 27; interorbital constriction, 4; zygomatic breadth, 19; mastoid breadth, 15.3; mandible, 24; maxillary tooth row (exclusive of incisors), 13.5; mandibular tooth row (exclusive of incisors), 14.7.

Hipposideros vittatus (PETERS).

Notwithstanding that this species was described from Ibo Island, Cape Delgado group, three males, Nos. 3297, 3299, 3301, alcoholic, from Zanzibar, seem more nearly allied to it than to any of the other recognized forms of the *gigas* group, of which it is the smallest member. The forearm and the tibia measurements given by Peters are 105 mm. and 40 mm. respectively, which agree well with the corresponding dimensions of our specimens given below.

MEASUREMENTS OF HIPPOSIDEROS VITTATUS.

No.	Head and Body.	Tail	Ear.	Fore-arm.	Thumb.	Second Digit.	Third Digit.	Fifth Digit.	Tibia.	Foot.
3297	107.0	34.0	31	103.5	20.0	77	147.0	111	39	19.5
3299	101.5	33.0	29	103.0	18.6	76	141.5	111	40	20.0
3301	—	38.6	30	105.4	20.0	78	146.0	112	40	20.0

The skull of No. 3299 measures: greatest length, 36.5; basal length, 29.5; interorbital constriction, 3.3; zygomatic breadth, 20; mastoid breadth, 17.5; height of sagittal crest, 5; mandible, 24.6; maxillary tooth row (exclusive of incisors), 12.3; mandibular tooth row (exclusive of incisors), 14.

PHYLLOSTOMIDAE.

Micronycteris minuta (GERVAIS).

This species was originally described from Brazilian specimens, and is well characterized by its short thumb and calcar, greater emargination of the inter-

femoral membrane, and very small second lower premolar, as compared with *M. megalotis*, with which it is found associated in Brazil. A specimen in alcohol, No. 4153, ♀, from Lagoa Santa, Brazil, measures as follows: head and body, 47; tail, 9.3; ear, 19.6; forearm, 34.4; thumb, 7.6; 3d digit, metacarpal, 27; 1st phalanx, 10.5; 2d phalanx, 12; 3d phalanx, 9.8; 4th digit, metacarpal, 28; 1st phalanx, 8; 2d phalanx, 10; 5th digit, metacarpal, 28.5; 1st phalanx, 8.5; 2d phalanx, 7.7; tibia, 13; foot, 8.5; calcar, 7.5. Skull: greatest length, 18; basal length, 14; interorbital constriction, 4; zygomatic breadth, 8; mastoid breadth, 8.6; mandible, 11; maxillary tooth row (exclusive of incisors), 6; mandibular tooth row (exclusive of incisors), 7. A young female, No. 4944, from Pernambuco, Brazil, still retains both upper and lower milk canines and the upper milk incisors, in addition to the permanent teeth.

Phyllostomus hastatus (PALLAS).

The geographic variation of this species in the matter of size has led to the recognition of at least two races in northern South America and Panama. I therefore append the measurements of three Brazilian specimens, No. 3983 from Rio Janeiro, Nos. 4080, 4085, from Rio das Velhas, as an aid to the further definition of the precise range of the typical subspecies.

MEASUREMENTS OF PHYLLOSTOMUS HASTATUS.

No.	Head and Body.	Tail.	Ear.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.
3983	107.0	17.0	32	87	16.0	162	108	31.5	21	22
4080	107.0	20.5	30	82	17.0	164	107	30.6	20	23
4085	108.5	21.0	33	83	16.5	154	105	29.0	19	21

The skull of No. 3983 measures: greatest length, 39.4; basal length, 31; interorbital constriction, 7.3; zygomatic breadth, 21.5; mastoid breadth, 21; mandible, 26; maxillary tooth row (exclusive of incisors), 18.6; mandibular tooth row (exclusive of incisors), 15.4.

Phyllostomus hastatus panamensis J. A. ALLEN.

I have referred to this race five well-made skins with skulls from Boruca, Costa Rica. Their measurements correspond fairly well with those given by Dr. J. A. Allen for the type, from Chiriqui, Panama.

MEASUREMENTS OF PHYLLOSTOMUS HASTATUS PANAMENSIS.

No.	Forearm.	Third Digit, Metacarp.	First Phalanx.	Second Phalanx.	Fifth Digit, Metacarp.	First Phalanx.	Second Phalanx.
12,312	87.0	85.0	21.0	43.5	79.0	17.0	18.5
12,313	87.0	81.0	20.4	40.5	78.0	15.7	18.0
12,314	94.5	83.5	21.0	43.0	78.0	16.5	20.0
12,315	92.0	84.0	20.0	42.0	76.8	16.0	18.0
12,316	94.0	83.0	21.0	43.0	80.0	16.5	19.0

These specimens represent a reddish and a black phase, with one individual intermediate.

Glossophaga soricina (PALLAS).

Three specimens from Zorritos, Peru, are a very little larger than others from Panama and Venezuela. Two of these are in the collection of the Peabody Museum, Yale University, and the third is No. 6994, Museum of Comparative Zoölogy. The forearms measure 36.4, 38.5, and 37 mm. respectively, thus about equalling that of *G. longirostris*, from which, however, the Peruvian bats are very different in cranial characters. Additional specimens may show that the Peruvian *Glossophaga* is a distinct race.

Glossophaga longirostris MILLER.

In addition to the type from the Santa Marta Mountains, Colombia, the collection contains a large series of skins (without skulls) from Union Island and Carriacou, Lesser Antilles. The younger individuals are of a nearly uniform clove-brown, but the adults become brighter, approaching a Vandyke brown (as in the type) or Mars brown. Ten adults from Carriacou average: forearm, 37.6 mm. (36.5-39); tibia, 15 (14.5-16); these measurements are the same as those of Venezuelan specimens, and are constantly greater than those of the allied *G. soricina* (forearm, 33 mm.; tibia, 13) that occurs with *G. longirostris* in northern South America.

Lonchophylla hesperia, sp. nov.

Type.—Adult male, alcoholic, No. 7011, Museum of Comparative Zoölogy; collected at Zorritos, Peru, by F. H. Bradley.

General Characters.—Apparently similar to *L. mordax* Thomas, but larger throughout.

Description. — The color of the fur cannot now be determined accurately, as the specimens examined have been in alcohol for many years; both above and below the bases of the hairs are pale tipped with darker. Thomas states that in the allied species, *L. mordax*, the hairs are cinnamon-brown above and wood-brown below, with whitish bases.

Both above and below the fur of the body extends out on the membranes as far as a line drawn from the middle of the humerus to the middle of the femur; a few scattered minute hairs on tibiae, toes, and lower surface of the interfemoral membrane.

Ear oval, the inner margin slightly convex to the broadly rounded-off tip. Outer margin very slightly concave from the tip to the middle, thence slightly convex to the shallow basal notch, which is succeeded by a low rounded lobe. Tragus tongue-shaped, pointed, its inner margin thickened; a small notch cuts off a basal lobe externally. Nose leaf triangular, slightly higher than broad, sides slightly concave at the upper third. Wings from the tarsus; interfemoral with its free edge slightly emarginate. Tail included in the basal third of interfemoral, but tip free on upper surface.

The lower lip is marked by a deep triangular median furrow, the sides of which are bordered by about five small rounded lobules, the distal of which is expanded laterally into a thin flat plate. The shape of this expansion is not the same in all the specimens, and it may be partially divided by a shallow notch of varying depth. In the alcoholic specimens of *Glossophaga* examined, the lobules or papillae bordering the labial groove are all small and roundish, and do not show the expansion found in the terminal ones of *Lonchophylla*. Thomas (*Ann. Mag. Nat. Hist.*, 1903, ser. 7, vol. 12, p. 459) in his description of the genus, was unable to determine whether or not the labial groove was present, as his specimens were all dried skins. The Peruvian species, however, shows this groove, as well as the peculiarities of the bordering papillae which may prove to be of generic value. (Pl. 1, Fig. 7)

Skull and Teeth. — The skull is long, with a narrow rostrum, and the lower jaw projects beyond the upper incisors. The symphysis is sharply keeled; zygomata incompletely ossified. The lower incisors form a slightly convex row, and the outer ones on each side do not quite touch the canine. Lower canines simple and slender, but the upper canines have a very distinct postero-internal cingulum cusp, which does not seem to have been previously noticed in the genus. Upper and lower premolars slightly spaced, though the first lower premolar is practically in contact with the canine. Both the upper premolars and the second and third lower ones have each a slight cingulum cusp anteriorly and posteriorly.

Measurements. — External measurements of the type: head and body, 60; tail, 9; depth of interfemoral, 21; forearm, 38; thumb, 9; 2d digit, metacarpal, 35; 3d digit, metacarpal, 41; 1st phalanx, 12; 2d phalanx, 20.6; 3d phalanx and tip, 8.5; 4th digit, metacarpal, 35.6; 1st phalanx, 9.5; 2d phalanx and tip, 12; 5th digit, metacarpal, 35.5; 1st phalanx, 9.7; 2d phalanx and tip, 11.5; tibia, 14; foot, 8; calcar, 8.8; ear from meatus, 14.5; tragus, 5.7; nose leaf from lip, 8.

Skull: greatest length, 28; basal length, 24.8; palatal length, 16; interorbital constriction, 4.7; breadth outside first molar, 5.6; mastoid breadth, 10; greatest breadth of brain case, 9.5; mandible, 20.3; maxillary tooth row (exclusive of incisors), 9; mandibular tooth row (exclusive of incisors), 9.4.

Remarks.—I am indebted to Professor A. E. Verrill, of Yale University, for the privilege of describing this species. The original lot contained three specimens, all from Zorritos, and one of these, the type, has been presented to the Museum of Comparative Zoölogy; the two others are in the Peabody Museum at Yale. The type is slightly the smallest of the three; the forearms of the two others measure 39.6 and 40.6 mm. respectively. The forearm of *L. mordax*, described by Thomas from Bahia, Brazil, is given as 34 mm., "all the specimens about the same," and the other measurements are correspondingly smaller in the eastern animal (3d digit, metacarpal, 31; 1st phalanx, 11.3; 5th digit, metacarpal, 29; 1st phalanx, 8.5; greatest length of skull, 23.7). It is not unlikely that further research will discover intergrades from the region between Peru and the Brazilian coast; but in the absence of these, the Peruvian bat may for the present stand as a full species. Additional measurements of the two other specimens at the Peabody Museum, New Haven, follow (original numbers are illegible):

MEASUREMENTS OF *LONCHOPHYLLA HESPERIA*.

Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fourth Digit.	Fifth Digit.	Tibia.	Calcar.	Ear.
65	13.0	40.6	8.5	84	59.5	57.5	15.0	9.5	15
62	10.5	39.6	9.0	82	60.5	55.0	14.8	8.5	16

The tongue of the second specimen projects 21 mm. beyond the nose.

Anoura geoffroyi GRAY.

A small series of adults and young was collected at Texolo, Vera Cruz, Mexico, on March 15, 1899.

Lonchoglossa caudifera E. GEOFFROY.

A series of five alcoholic females from Rio Janeiro, Brazil, shows an interesting variation in the development of the rudimentary tail. In Nos. 4000 and 4001 it distinctly projects just beyond the free border of the uropatagium, and consists in the former of four vertebrae (outside the body), the terminal one of which is much shorter than the others, and whose combined length is 4 mm. In No. 4006 the tail is about 3.5 mm. long outside the body, and only reaches to

within about 1 mm. of the free border of the interfemoral membrane; it, too, seems to consist of four vertebrae in the membrane, the terminal one of which is smallest and apparently somewhat cartilaginous. In No. 3984 the tail is still further reduced, and extends to within but 3 mm. of the free edge of the membrane, and only three external vertebrae are with certainty distinguishable.

Vampyrops lineatus (E. GEOFFROY).

A series in alcohol from eastern Brazil (Bahia, Macaco, Minas Geraes) is referred to this species. The average forearm measurement of nine individuals is 47.7 mm., which closely approximates that (46 mm.) given by Lyon for a specimen from Paraguay, the type locality.

Vampyrodes major, sp. nov.

Type.—Adult female, alcoholic, No. 6756, Museum of Comparative Zoölogy; collected at San Pablo, Isthmus of Panama, by Allen Lesley.

General Characters.—Allied to *Vampyrodes caracciola* Thomas, but larger throughout.

Description of Type.—It is now impossible to say what was the original color of the type, as it has been preserved in spirits for a number of years. The color of the fur *in alcohol* is burnt umber dorsally, similar but paler below. Two broad white stripes, starting one on each side of the nasal eminence, and 4 mm. apart at their origin dorsally, pass backward slightly above the eye to the upper posterior root of the ear. These stripes are about 3 mm. broad throughout. A second white stripe, less well defined, runs from below the anterior corner of the eye on each cheek to the outer base of the ear. A very narrow white stripe runs medially from the occiput to the end of the spine. Tips of the wings whitish.

Dorsally the fur extends out on the wing membranes as far as a line joining the elbow and the knee and along the dorsal surface of the forearm. There is a slight pubescence at the base of the thumb. The hind limbs are practically naked save for a few scattered short hairs; interfemoral membrane with a few long hairs from the median border; inferior surfaces of the membranes naked; base of the ears, posteriorly, covered with fur, and a thin tuft of long hairs on the inner anterior margin of the conch.

Nose leaf well developed, its anterior border free, horseshoe-shaped; the erect portion broadest at the base, tapering to the pointed summit, and with a central thickened, mitre-shaped area. On the lower lip is a large median glandular swelling, rounded, with a smaller oval swelling at each side at the edge of the lip. A row of five or six small roundish glands runs from the edge of the lip on each side down below the large central gland. A curved glandular swelling is present at the base of the nose leaf on each side.

Inner margin of ear, regularly convex, summit rounded and somewhat flattened; upper half of outer margin nearly straight; lower half convex to the basal lobe,

whose outline is nearly semicircular but flattened. The outer basal three-fourths of the ear-conch is provided with about a dozen transverse rugae. Tragus thick, acuminate, triangular in section, with a basal lobe, succeeded distally by a deep notch.

Measurements.—External measurements of the type: length of head and body, 76; eye to nostril, 7; ear from meatus, 20.5; ear from crown, 13.5; tragus, 6; forearm, 55.5; thumb, 15.3; 2d digit, metacarpal, 45; 3d digit, metacarpal, 54; 1st phalanx, 20; 2d phalanx, 30; 3d phalanx and cartilaginous tip, 17; 4th digit, metacarpal, 53; 1st phalanx, 16; 2d phalanx and tip, 21; 5th digit, metacarpal, 54.5; 1st phalanx, 12.4; 2d phalanx and tip, 17.5; tibia, 18.5; foot, 14; calcus, 6; nose leaf, greatest length, 12.4; greatest width, 7; width of interfemoral membrane medially, 6.5.

Skull and Teeth.—The skull is of the Vampyrops type, with broad short muzzle and narrow braincase, with an evenly convex profile. The sagittal crest is only slightly developed. Dental formula:

$$I \frac{2-2}{2-2}, C \frac{1-1}{1-1}; P M \frac{2-2}{2-2}, M \frac{2-2}{3-3}.$$

The suppression of the metacone in the second upper molar gives that tooth a very flat appearance in side view as contrasted with the first upper molar. The skull of the type measures: greatest length, 29; basal length, 22.8; interorbital constriction, 7; greatest width outside second upper molar, 13; palatal length, 15; zygomatic breadth, 18.5; mastoid breadth, 14.3; mandible, 20; maxillary tooth row (exclusive of incisors), 10.5; mandibular tooth row (exclusive of incisors), 11.6.

Remarks.—Hitherto but one species of the genus Vampyrodes has been recognized, *V. caracciola* (Thomas). This was described from a Trinidad specimen, which probably represents an island form. I have found no record of additional specimens from Trinidad, and its presence on the mainland of South America seems hitherto to have escaped notice. It is therefore of especial interest to find this larger representative of the genus in Panama. In addition to its greater size, there seem to be color differences as well, for Thomas does not mention the short inferior cheek stripe that is present in our specimen.

Artibeus planirostris (SEIX).

In an adult male specimen from Bahia, Brazil, the evanescent third upper molar usually found in this species is absent on both sides, though in a second specimen from the same locality and a third from Rio Janeiro this tooth is present. No doubt the absence of this small molar in two specimens (Nos. 10,454, 10,455) from Bogaba and Boquete, Panama, respectively, led to their identification as young of *Artibeus intermedius* (Bangs, Chiriqui Mammalia. Bull. Mus. Comp. Zool., 1902, vol. 39, p. 50), with the description of which they seemed to agree fairly well. As stated by Mr. Bangs, however, both specimens are quite

adult, and a more recent comparison with specimens of the two species shows conclusively that they are simply adults of *planirostris* that have lost the small upper third molar. Rehn (Proc. Acad. Nat. Sci. Phila. for 1900, 1901, p. 756) mentions a Brazilian bat of this species that lacked the last upper molar on but one side, and a second that had lost both these teeth. No doubt they are commonly deciduous in adults. For comparison with specimens from other localities, I have appended the external measurements of two alcoholic specimens, Nos. 197, 3076, from Bahia, Brazil (the type locality), and a third, No. 3854, from Rio Janeiro, Brazil, all in the Museum collection.

MEASUREMENTS OF ARTIBEUS PLANIROSTRIS.

No.	Head and Body.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.	Nose Leaf.	Ear.
197	76	64.0	11.7	130.0	88.5	25.0	15.5	8.0	12.4	23.0
3076	74	63.0	15.2	125.5	90.0	23.0	13.0	8.0	12.2	22.3
3854	—	61.5	16.0	122.5	86.0	22.5	13.5	7.5	12.0	22.5

The following measurements are from the skull of No. 197, adult male, from Bahia: greatest length, 31.6; basal length, 25.5; palatal length, 16.3; inter-orbital constriction, 7; zygomatic breadth, 19; mastoid breadth, 17; mandible, 22.5; maxillary tooth row (exclusive of incisors), 11.5; mandibular tooth row (exclusive of incisors), 13; palatal width outside first molar, 14.3.

Artibeus grenadensis (ANDERSEN).

Artibeus planirostris grenadensis Andersen, Ann. Mag. Nat. Hist., 1906, ser. 7, vol. 18, p. 420.

Mr. K. Andersen has recently named the island form of the *planirostris* group occurring on Grenada, but gives only the briefest diagnosis and no measurements. Two skins in the collection, taken at St. George, Grenada, are uniformly darker than specimens of *planirostris* from the neighboring mainland, nearly Prout's brown instead of clove brown, and are quite without indication of facial stripes. Their size is slightly less throughout than in continental *planirostris* from the type locality and from Panama. The skulls of the Grenada *Artibeus* are also smaller with slightly lighter dentition, and the second lower molar is very noticeably shorter.

In one of our specimens the minute third upper molar is present, but in the other it is lacking on the left side, although the empty socket is still visible. In view of the marked differences as compared with its nearest geographical relatives, and its probable limited range, this form may stand as a species.

Artibeus jamaicensis LEACH.

A single skin of this species from Kingston, Jamaica, measures as follows: head and body (collector's measurement), 86; ear, 18; forearm, 58; thumb, 14; 2d digit, metacarpal, 44; 3d digit, metacarpal, 53; 1st phalanx, 16.5; 2d phalanx, 27; 4th digit, metacarpal, 53; 1st phalanx, 14; 2d phalanx and tip, 20; 5th digit, metacarpal, 55; 1st phalanx, 11; 2d phalanx and tip, 16; foot, 16.5; calcar, 7.

The Jamaican *Artibeus* seems more nearly allied to those of the *planirostris* group from its small size, indistinct facial stripes, and the minute grayish tipping of the body hairs, and differs greatly in general appearance from the larger *intermedius* and *palmarum* in which the facial stripes are more clearly defined and the frosting of grayish tips is absent.

Artibeus lituratus (LICHTENSTEIN).

Mr. Oldfield Thomas (Ann. Mag. Nat. Hist., 1901, ser. 7, vol. 8, pp. 192, 441) has revived Lichtenstein's name for the large *Artibeus* of southern Brazil, but no measurements seem available in recent literature. I have therefore included the measurements of three adults, Nos. 188, 1277, 5004, taken at Rio Janeiro, Macaco, and near Santarem, Brazil, respectively. These specimens, with four others from Brazil, are preserved in alcohol.

MEASUREMENTS OF ARTIBEUS LITURATUS.

No.	Head and Body.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.	Nose Leaf.	Ear.
188	80	72.5	18.5	142	94	25	17.0	8.5	13.5	22
1277	88	74.0	17.0	155	106	27	17.3	9.0	13.3	24
5004	82	70.5	17.0	146	103	25	18.0	9.0	14.0	23

The skull of No. 5004 measures: greatest length, 31; basal length, 24.2; palatal length, 15; interorbital constriction, 7; zygomatic breadth, 18.5; mastoid breadth, 17; mandible, 21.5; maxillary tooth row (exclusive of incisors), 11; mandibular tooth row (exclusive of incisors), 12; palatal width outside first molar, 13.4.

Artibeus intermedius J. A. ALLEN.

Four skins and skulls of this bat have recently been received from Boruca, near San José, Costa Rica (the type locality). These, with one exception, are adults and agree in being uniformly broccoli brown or drab above, and nearly Prout's

brown below, with a narrow facial stripe on each side from near the posterior base of the nose leaf to the ear. The forearm measurements of three of these specimens are 65, 70, 71.5 mm., respectively, or a trifle larger than that given for the type (65 mm.). The hair is nearly uniform in color to the base instead of having lighter bases as in *A. jamaicensis* and *A. planirostris*.

Artibeus palmarum ALLEN AND CHAPMAN.

This is a distinctly larger species than *intermedius*, without the bluish cast to the fur; it also seems to be decidedly more of a russet when adult. No. 10,471, adult female from Bogaba, Panama, is the specimen referred to as *A. intermedius* in Bull. Mus. Comp. Zool., 1902, vol. 39, p. 50, but a comparison with Costa Rican specimens shows that it is not that species. No doubt the range of *A. palmarum* is more southern, from Panama eastward along the northern coast of South America. The type specimen of *A. femur-villosum* Bangs is also in the Museum collection, and as pointed out by Dr. J. A. Allen (Bull. Amer. Mus. Nat. Hist., 1900, vol. 13, p. 89), is clearly *A. palmarum* as at present understood. This specimen is from La Concepcion, Colombia, and the name might therefore be applicable to the continental form, should it prove eventually to be distinct from that of Trinidad. The difference in size between *A. palmarum* and *A. intermedius* may be inferred from the fact that the third metacarpal of three specimens (from Bogaba, Panama, and La Concepcion, Colombia) averages 66.6 (65-68.8), as against 62.7 (62-66) for four Costa Rican *A. intermedius*. Unfortunately the forearms are broken in the skins of two of our adult *palmarum*. In one from Panama, however, this bone is entire and measures about 77 mm.

THYROPTERIDAE.

Thyroptera albiventer (TOMES).

The status of this species has hitherto been doubtful, and Miller in his recent synopsis of the genera of bats (Bull. 57, U. S. Nat. Mus., 1907, p. 192) says that but "two species are now recognized," viz., *T. tricolor* of Brazil, and *T. discifera* of northern South America and Central America. The same writer in a previous paper (Proc. Biol. Soc. Washington, 1896, vol. 10, p. 109-112) summarized the characters wherein the four described species are supposed to differ, but through a lack of specimens was unable to determine the validity of any but *T. discifera*. The Museum collection contains a mounted specimen (No. 6277) of this genus from "Ecuador" that appears to be *T. albiventer* of Tomes, whose type came from the Rio Napo, near Quito, Ecuador. It differs from *T. discifera*, its probable nearest ally, in the color of the fur, which is about a Vandyke brown dorsally, but below, that of the chin, throat, and central parts of the chest and abdomen is whitish throughout, while that of the sides is a light Vandyke brown basally, with whitish tips. In a specimen of *T. discifera* from San Julian, Venezuela, the entire pelage is Vandyke brown, not darker at the bases of the hairs, while in our speci-

men of *T. albiventer* the hairs are slightly darker at their bases than at their tips. This specimen does not seem to have become faded appreciably, notwithstanding its exposure in an exhibition case. The tail, as in *T. discifera*, extends apparently just beyond the posterior border of the interfemoral membrane, thus differing from *T. tricolor*, in which from "one fourth to one third" is free from the interfemoral membrane. The third and fourth digits of the pes appear to show syndactylism, as in *T. discifera*, though in the specimen as mounted this is a trifle difficult to determine. The measurements of our Ecuadorean specimen are not sensibly different from those of *T. discifera*.

VESPERTILIONIDAE.

Myotis adversus (HORSFIELD).

A single female, alcoholic, No. 6869, was collected by Mr. Thomas Barbour at Buitenzorg, Java, and by him presented to the Museum. It measures as follows: head and body, 46; tail, 38; ear, 16; tragus, 6.6; forearm, 37; thumb, 6; 2d digit, metacarpal, 32; 1st phalanx, 3.6; 3d digit, metacarpal, 36.6; 1st phalanx, 14.5; 2d phalanx and tip, 19; 4th digit, metacarpal, 35; 1st phalanx, 10; 2d phalanx and tip, 11; 5th digit, metacarpal, 34; 1st phalanx, 8; 2d phalanx and tip, 9; tibia, 16; foot, 10; calcar, 14. Skull: greatest length, 15.5; basal length, 12.7; palatal length, 8; interorbital constriction, 3.5; zygomatic breadth, 9.4; mastoid breadth, 7.8; mandible, 11; maxillary tooth row (exclusive of incisors), 5.8; mandibular tooth row (exclusive of incisors), 6.1. The large foot of this species is in marked contrast to the small delicate pes of *M. muricola*, which also occurs at Buitenzorg.

Myotis goudoti (SMITH).

The collection contains two alcoholic females from Madagascar, Nos. 5986, 5987, whose measurements, on account of the paucity of such data, are here given, the second measurement in each case being that of No. 5987: head and body, 44, 44; tail, 40.5, 42; ear, 17, 16; tragus, 6.5, 6; forearm, 41, 38.5; thumb, 7.7, 8.2; 2d digit, metacarpal, 37, 34; 3d digit, metacarpal, 38, 35; 1st phalanx, 13.6, 12; 2d phalanx and tip, 19.6, 19; 4th digit, metacarpal, 38, 34; 1st phalanx, 10.5, 10; 2d phalanx and tip, 11, 10; 5th digit, metacarpal, 36, 33.5; 1st phalanx, 9, 9; 2d phalanx and tip, 9, 9.8; tibia, 17, 16; foot, 10.6, 9; calcar, 13.8, 14.2. The skull of No. 5986 measures: greatest length, 15.5; basal length, 13; palatal length, 8; interorbital constriction, 3.5; zygomatic breadth, 9.8; mastoid breadth, 8; mandible, 11.5; maxillary tooth row (exclusive of incisors), 6; mandibular tooth row (exclusive of incisors), 6.2.

Myotis muricola (HODGSON).

Two specimens from Sarawak, Borneo, are referable to this species, as well as a series of fourteen from Batavia and Buitenzorg, Java, collected by Mr. Thomas

Barbour. The measurements of these bats are essentially the same as those recorded by Miller (Proc. U. S. Nat. Mus., 1903, vol. 26, p. 473) for a series from Simalur Island, near Sumatra.

***Myotis lucifugus* (LE CONTE).**

The collection contains a large number of specimens from many localities, including Bay St. George, Newfoundland; Restigouche, New Brunswick; Okanogan and Vernon, British Columbia; and Salt Lake, Utah. This is the common bat of the limestone caves of Kentucky, Indiana, and other adjoining States, where immense numbers are known to spend the winter. Notwithstanding Miller's statement that "the skull of *M. subulatus* does not closely resemble that of *M. lucifugus*," it is nevertheless true that specimens of these two common and nearly related species of eastern and central North America are sometimes difficult to distinguish from each other, especially if unaccompanied by skulls. In addition to the longer ears and longer, more sharply pointed tragus of *subulatus*, however, I have found a very constant and useful difference in the lengths of the metacarpal bones. In *M. lucifugus* the third metacarpal is longest, and forms with the fourth and fifth a graduated series. Usually each of the two latter bones is conspicuously shorter than the one preceding it, although in some individuals this difference is slight. In *M. subulatus*, however, the gradation is absent in the specimens that I have examined, with but two exceptions: a specimen from an unknown locality, with a slight gradation of the metacarpals; and a second, locality unknown, in which this feature is more pronounced. It is not unlikely that in case of these two allied species, inhabiting much the same extent of territory, hybridization should occasionally take place. Three or four specimens in the collection are possibly hybrids between these two species. Thus No. 4423, from Missouri, has a large ear for *lucifugus* (length from meatus 16 mm., tragus, 7), though somewhat smaller than that of *subulatus*. The mandibular tooth row measures 7.3 mm., which is practically the same as for *subulatus* (as against 6-6.6 for *lucifugus*); the metacarpals are, further, intermediate in that the fourth and fifth, though both shorter than the third, are *equal*.

***Myotis californicus* (AUDUBON AND BACHMAN).**

The presence of this species in Colorado has only recently been established, although I find in the collection a skin with skull from Colorado City, Colo., that was taken August 2, 1871. There is likewise a second specimen labelled "Colorado." Two skins were collected in August, 1905, in Chihuahua, Mexico, by the John E. Thayer Expedition.

***Myotis nigricans* (WIED).**

A considerable series of this bat from eastern Brazil, the type locality, has made it possible to compare typical specimens with alcoholics from Santa Marta,

Colombia, and from Panama. Those from northern South America seem identical in all respects with the Brazilian individuals. The second premolar of both jaws usually tends to be drawn in slightly from the tooth row. In one specimen, No. 4286, from Lagoa Santa, Brazil, the second lower premolar of the left side is lacking, and the corresponding upper premolar is somewhat reduced in size. In No. 8061, from Santa Marta, Colombia, the minute second premolar is lacking from the right maxillary row, and the first premolar stands nearly in the centre of the space between the third premolar and the canine. The tendency to lose this almost non-functional tooth is of interest as showing the probable future course of evolution, and a similar tendency is well known in various species of bats in case of these and other teeth.

Myotis subulatus (SAT).

A skin with skull from Chihuahua, Mexico, was collected August 10, 1905, by the John E. Thayer Expedition, and seems typical in every way. The collection also contains specimens from Grand Menan, N. B., and Lake Edward, Quebec, to Arkansas. The possibility of hybridization occurring between this species and *M. lucifugus* has been mentioned under the latter.

Pipistrellus abramus (TEMMINCK).

This species is common and generally distributed in southeastern Asia. Mr. Thomas Barbour collected a large series at Buitenzorg, Java, and also obtained four in alcohol from Oshima, Loo Choo Islands, and one from Yokohama, Japan. This bat has not previously been recorded from the Loo Choos. The Javan series shows more or less individual variation. The forearm measurement of twenty-five specimens averages about 34.7 mm. (32.6–36.5). The outer upper incisor usually just exceeds the cusp of the inner incisor in vertical extent, but is worn down more rapidly than the latter, so that in old skulls it is distinctly shorter than the cusp. In one case, however, the outer upper incisor is distinctly shorter than the cusp of the inner, although the teeth are apparently unworn. An adult female from Buitenzorg contained two large fetuses.

Pterygistes lasiopterus (SCHREBER).

Three adults in alcohol were obtained from Hondo, Japan, by Mr. Thomas Barbour, and by him presented to the Museum. Japanese and Chinese specimens are both currently referred to *lasiopterus*, but I have had no opportunity to compare the insular with continental examples. The dimensions of these specimens are here given.

MEASUREMENTS OF PTERYGISTES LASIOPTERUS.

No.	Head and Body.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.	Ear.
6929	82.0	60.0	9.5	111	65.5	22	11.0	24	18.0
6930	88.0	62.0	10.5	113	67.0	22	11.0	25	17.6
6931	81.5	60.5	10.0	107	65.5	22	11.7	21	19.0

The skull of No. 6929 measures: greatest length, 22; basal length, 19.8; palatal length, 11; interorbital constriction, 5.6; mastoid breadth, 13; mandible, 17.2; maxillary tooth row (exclusive of incisors), 8.6; mandibular tooth row (exclusive of incisors), 9.3.

Eptesicus nasutus (DOBSON).

This species seems to be rare in collections. A skin with skull from Amballa, India, agrees almost exactly with the measurements given by Dobson for the type from Sciude, India. He states, however, that the wing and interfemoral membranes are almost naked, but in our specimen the interfemoral is thinly haired from the knee about to the end of the third caudal vertebra. The following measurements are from the skin, No. 5147, from Amballa: forearm, 37; third finger, metacarpal, 34.5; 1st phalanx, 13; 2d phalanx, 11; 4th digit, metacarpal, 35; 1st phalanx, 12; 2d phalanx, 8; 5th finger, metacarpal, 34; 1st phalanx, 9; 2d phalanx, 6; tibia, 14; foot, 7.

The skull approaches that of *Vespertilio* in the rather strongly marked concavity between the orbit and the nares on each side, but the nasal emargination is shallow, as in other members of the genus *Eptesicus*. The dimensions of the skull are: total length, 14.2; basal length, 13; palatal length, 7.5; interorbital constriction, 3.7; zygomatic breadth, 9.3; mastoid breadth, 8; mandible, 10.5; maxillary tooth row (exclusive of incisors), 5; mandibular tooth row (exclusive of incisors), 5.5.

Scabrifer¹ notius, sp. nov.

Type. — Adult male, alcoholic, No. 4555, Museum of Comparative Zoölogy; collected at Cape Town, Africa, and received from E. L. Layard.

General Characters. — Size as in *S. floweri* (De Winton), but the fur very dark basally, with light tips. The curious wart-like papillae characteristic of this genus

¹ Scabrifer, new name for *Rhinopterus* Miller, 1906, preoccupied by *Rhinoptera* Kuhl, 1841.

are *sparsely* scattered on both surfaces of the humerus, the forearm, finger bones, tail, and tibiae.

Description of the Type.—Color of the fur in alcohol dorsally and ventrally nearly mummy brown, lighter, approaching hair brown at the tips. As the type has been immersed in alcohol for many years, it is possible that the fur is still darker in the living animal. The ears and muzzle are pale.

Dorsally the fur covers the body thickly, but is practically absent from the membranes. The bases only of the ears are clothed, and the somewhat swollen muzzle is thinly clad with short minute hairs and sparser longer ones. Ventrally the membranes are likewise naked, save for the proximal half of the tail and interfemoral, which are thinly covered with short hairs.

The ear, laid forward, reaches nearly to the nostril; it is rounded at the inner basal angle, then nearly straight in outline to the broadly rounded tip. Externally there is a slight concavity below the tip, and the lower half is again nearly straight to the basal notch that separates off the low rounded terminal lobe. The tragus is narrow, bluntly pointed, and rather short.

The wing membrane arises from the base of the toes. The calcar is strongly keeled, but without a terminal lobe. The tip of the tail is free for about 2.5 mm. The curious wart-like papillae characteristic of this genus seem much fewer than in *S. floweri* from the Soudan and are practically absent from the membranes, whereas in the latter species the upper side of the forearms, legs, and tail, and all the proximal portion of the wings and interfemoral membrane are thickly studded with them. In the new species there are dorsally some half-dozen papillae on the humerus, a few at the proximal end of the forearm, but a thicker cluster of from 15 to 20 at the distal end of the forearm; a few are also scattered along the metacarpals and phalanges, and on the dorsal surface of the femora, tibiae, and metatarsals, as well as at the region of the joints on the upper side of the tail. Ventrally the distribution of these warts is about the same, but they are more numerous on the humerus and almost wholly lacking on the fingers, tibiae, and tail.

Skull and Teeth.—As stated by Miller, the skull resembles that of a small *Eptesicus*, and is somewhat flattened, with an almost straight dorsal profile. The inner upper incisors are long and slender with a faint indication of a cusp near the tip, laterally. The outer incisor is not quite half the height of the inner, and like that tooth has a strongly developed cingulum that forms a slight cingulum cusp. The outer cusps of the mandibular molars are long and rather slender.

Measurements.—The external measurements of the type are as follows: head and body, 49; tail, 37; ear, 13.5; tragus, 5; forearm, 35; thumb, 5.3; 2d digit, metacarpal, 30.5; 3d digit, metacarpal, 32.3; 1st phalanx, 12.7; 2d phalanx, 9; 3d phalanx and tip, 7; 4th digit, metacarpal, 32.5; 1st phalanx, 12; 2d phalanx and tip, 8; 5th digit, metacarpal, 32.5; 1st phalanx, 9.2; 2d phalanx and tip, 5.6; tibia, 12.8; foot, 6.

Skull: greatest length, 14.3; palatal length, 6.6; interorbital constriction, 3.6; mastoid breadth, 8; palatal breadth outside second molar, 5.6; mandible, 10.3; maxillary tooth row (exclusive of incisors), 5; mandibular tooth row (exclusive of incisors), 5.5.

Remarks. — *Scabrier floweri* from the White Nile and Soudan seems to be a pallid species, while the new species here described is dark-furred, with a much less development of the dermal papillae that give an encrusted appearance to those parts where they occur. The two appear not to differ in size.

***Tylonycteris pachypus* (TEMMINCK).**

Seven specimens in alcohol were recently presented by Mr. Thomas Barbour, by whom they were collected at Sindanglaia, Java. The forearm measurement of these bats averages 27 mm. (26.5–27.4).

***Scoteinus pallidus* (DOBSON).**

The collection contains a series of skins with skulls from the Koolloo Valley, India.

***Pachyotus temminckii* (HORSFIELD).**

Most recent writers have considered this Javan species identical with the Indian *P. kuhlii* Leach. A series from Buitenzorg, Java, collected by Mr. Thomas Barbour, shows conclusively, however, that the insular representative constitutes a very distinct species. In alcohol the Javan specimens are darker ventrally than *kuhlii* (apparently olivaceous instead of clear yellowish white); in addition, the measurements are smaller throughout. The measurements of the Javan bats follow.

MEASUREMENTS OF PACHYOTUS TEMMINCKII.

No.	Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.	Ear.
6799	67	49	52.0	7.0	84.0	59	18.0	10.0	18.7	14.5
6800	63	46	52.0	7.5	83.0	58	18.8	10.0	17.0	14.5
6801	67	48	54.5	8.6	89.5	61	19.0	10.6	19.0	14.7
6802	62	47	53.0	8.7	88.0	61	19.0	10.3	18.0	15.3
6803	65	50	52.0	8.7	91.5	62	20.0	10.0	20.0	15.0
6804	69	48	54.0	8.0	92.0	64	19.7	9.5	19.5	15.0
6805	64	50	55.5	8.8	92.0	66	20.0	10.5	17.0	15.5

The skull of No. 6803, ♂ adult, measures: greatest length, 20.4; basal length, 17; palatal length, 10.3; interorbital constriction, 5.5; zygomatic breadth, 14; mastoid breadth, 12; mandible, 14.8; maxillary tooth row (exclusive of incisors), 7; mandibular tooth row (exclusive of incisors), 8.

By way of comparison, I give the measurements of an adult female, *P. kuhlii*, No. 6979, from Delhi, India, collected by Mr. Thomas Barbour: head and body, 76; tail, 50; forearm, 56.5; thumb, 9.2; third finger, 99; fifth finger, 69; tibia, 22; foot, 11.5; calcar, 20; ear, 16.5. Skull: greatest length, 22.2; basal length, 18; palatal length, 11; interorbital constriction, 5; zygomatic breadth, 15; mastoid breadth, 12.5; mandible, 16; maxillary tooth row (exclusive of incisors), 8; mandibular tooth row (exclusive of incisors), 9. This specimen is rather small, as the average length of the forearm of eight other specimens from the Koolloo Valley and Delhi, India, is 60 mm. (59-64). In addition to the greater size of the skull and teeth of *kuhlii*, the occipital crest shows a much stronger development than in *temminckii*.

Pachyotus castaneus (HORSFIELD).

A single specimen, female adult, No. 6933, from Buitenzorg, Java, I have provisionally referred to this species, although it seems a trifle larger than specimens from the Malay Peninsula. It was collected by Mr. Thomas Barbour, and by him presented to the Museum. Bonhote (Proc. Zool. Soc. London, 1900, p. 192) gives the forearm measurement of continental examples as from 49 to 52 mm. (average 50.7), and states that the color is a uniform chestnut all over, not lighter below. Our specimen is somewhat larger than these measurements indicate, and the dorsal fur, in alcohol, is distinctly darker than that of the ventral surface. A series of this bat from Java might show that the insular animal is a distinct species. The measurements of No. 6933 are as follows. External measurements: head and body, 64; tail, 58; ear, 13.5; forearm, 55.6; thumb, 8; 3d finger, metacarpal, 52.5; 1st phalanx, 19; 2d phalanx and tip, 19; 4th finger, metacarpal, 52; 1st phalanx, 15; 2d phalanx and tip, 11; 5th finger, metacarpal, 47.5; 1st phalanx, 10; 2d phalanx and tip, 8.5; tibia, 22; foot, 9.5; calcar, 16.

Skull: greatest length, 21.3; basal length, 17.5; palatal length, 10.7; interorbital constriction, 5.4; zygomatic breadth, 14.5; mastoid breadth, 12.5; mandible, 15; maxillary tooth row (exclusive of incisors), 7.5; mandibular tooth row (exclusive of incisors), 8.5.

Chalinolobus gouldi (GRAY).

An old female, No. 745, from Hobertstown, Australia, lacks the small upper premolar on both sides, and thus shows an interesting parallelism with the related African genus *Glauconycteris*, in which these teeth are now permanently lost.

Plecotus sacrimontis, sp. nov.

Plecotus auritus Peters, Monatsber. königl. preuss. Akad., Berlin, 1880, p. 24 (part); Auct.

Type. — Adult male, alcoholic, No. 6932, Museum of Comparative Zoölogy; collected on Mt. Fuji, Japan, 4 December, 1906, by Alan Owston, and presented by Mr. Thomas Barbour.

General Characters. — Resembling *P. auritus* of Europe, but larger, with a longer and broader skull. The tibia and the thumb are noticeably longer than in *P. auritus*, but the ears are of about the same size.

Description of the Type. — Color, in alcohol, dorsally a uniform brown, nearest to bistre of Ridgway, the bases of the hairs much darker; ventrally the hairs are slate color at the bases, broadly tipped with light smoke gray.

The membranes are naked, but the very large ears are provided with a fringe of short hairs on the basal two thirds of their inner margin and for an equal distance along the keel of the ear conch. There are also a few small scattered hairs at the base of the ear externally, and on the inner face distally. A few stiff appressed hairs cover the back of the foot. About two dozen transverse rugae are present on the exterior two thirds of the ear. The very large tragus is similar to that of *P. auritus*, and bears a few minute scattered hairs on its outer face. Wing membrane from the base of the toes; calcar long and slender, without a keel, and terminating in a small but distinct lobe. The last caudal vertebra is free.

Skull and Teeth. — The skull and teeth are larger throughout than in the European species; the difference in the length is rather more striking than that in breadth. The cranial dimensions are given below.

Measurements. — External measurements (for comparison, the corresponding measurements of *Plecotus auritus*, from Europe, No. 3279, ♂ adult, are added in parentheses after each): head and body, 42 (40); tail, 44 (45); ear, 39 (36); tragus, 15.5 (15); forearm, 40 (39); thumb, 11.7 (7); 2d digit, metacarpal, 34 (32); 3d digit, metacarpal, 34.3 (35); 1st phalanx, 14.4 (14); 2d phalanx and tip, 20.5 (18.5); 4th digit, metacarpal, 35 (34.2); 1st phalanx, 9.5 (9); 2d phalanx and tip, 10 (9); 5th digit, metacarpal, 33.4 (33); 1st phalanx, 9.5 (9.3); 2d phalanx and tip, 10.5 (9.3); tibia, 21 (18.8); foot, 10.6 (7); calcar, 12 (14.5).

Skull: greatest length, 17.5 (16.2); basal length, 14 (13.3); palatal length, 8.2 (7.3); interorbital constriction, 4 (3.7); zygomatic breadth, 9 (8.5); mastoid breadth, 9 (8.6); mandible, 11.5 (10); maxillary tooth row (exclusive of incisors), 5.8 (5); mandibular tooth row (exclusive of incisors), 6 (5.5).

Distribution. — So far as known this bat is confined to Japan.

Remarks. — The longer and larger thumb (Pl. 1, Fig. 5) of the Japanese *Plecotus*, without corresponding appreciable increase of length in the other bones of the hand, together with the larger foot, longer tibia, and bigger skull, at once

separate this species from *P. auritus* of Europe. According to Dobson (Cat. Chiroptera Brit. Mus., 1878, p. 179) *P. homochrous* from Nepal, Himalayas, has thumbs even shorter than those of *P. auritus*, and is said by Barrett-Hamilton to be a larger animal than *P. puck* recently described by him from Murree, northern India. I have seen no specimens from eastern continental Asia, but it is possible that they are not to be distinguished from Japanese individuals.

Miniopterus schreibersii (NATTERER).

The type locality of this species is Germany, but its range is currently believed to extend eastward to the Pacific Ocean. At least six rather closely related species are described from Africa (*M. dasythrix*, *M. fraterculus*, *M. majori*, *M. manavi*, *M. natalensis*, *M. inflatus*), but some confusion still exists as to the number of Asiatic forms. In Asia, as in Africa, there appear to be a large and a small species living side by side throughout at least a large part of the range of the genus. The series of Asiatic specimens in the Museum collection shows that some at least of the various names given to the eastern representatives of the genus should be recognized as applying to valid species. Thomas (Ann. Mag. Nat. Hist., 1907, ser. 7, vol. 20, p. 197) has recently described *M. schreibersii pallidus* as a pale desert race of the type species, from the south coast of the Caspian Sea, but does not indicate its eastward range. The large form occurring in India may be conspecific with *M. schreibersii*, to which I have provisionally referred a single adult female, No. 3258, from Calcutta. This bat agrees practically in measurements with those given for German specimens, although I have had no opportunity for direct comparison with bats of this genus from Europe. The Calcutta bat measures: head and body, about 61; tail, 58; ear, 12; forearm, 50; thumb, 6; 2d digit, metacarpal, 42; 1st phalanx, 3; 3d digit, metacarpal, 42.5; 1st phalanx, 10.5; 2d phalanx and tip, 39; 4th digit, metacarpal, 40.4; 1st phalanx, 9.5; 2d phalanx and tip, 18; 5th digit, metacarpal, 37.5; 1st phalanx, 9.5; 2d phalanx, 10.3; tibia, 18.5; foot, 10; calcar, 13.5. The skull measures: greatest length, 17; basal length, 14.3; palatal length, 8.1; interorbital constriction, 4; zygomatic breadth, 9.6; mastoid breadth, 9.1; mandible, 13; maxillary tooth row (exclusive of incisors), 6.6; mandibular tooth row (exclusive of incisors), 7.1. Compared with the skull of what is here considered *M. blepotis* from Amboina, that of the Indian specimen is slightly broader, and with the braincase so inflated antero-laterally as to give it a more nearly circular outline when viewed from above, instead of the distinctly oval shape of the other species.

To this species is doubtless referable the large specimen recorded by Dobson (Cat. Asiat. Chiropt., 1876, p. 163) as collected at Isagine, Upper Burmah. Its forearm measurement is given as two inches (51 mm.).

Should it eventually prove that the Indian *Miniopterus* is distinct from the European, Hodgson's name, *fuliginosus*, may apply to it.

Miniopterus schreibersii japoniae THOMAS.

Compared with *M. blepotis*, which appears to be the nearest ally of the Japanese species, *M. s. japoniae* differs strikingly in its large foot and very short, broad ear. The tibia and forearm are also slightly larger, and the thumb is stouter. The differences are absolutely small, but relatively large, and result in a very different appearance of these parts. Two specimens from Mt. Fuji, Japan, measure respectively: forearm, 46.5, 47; ear from meatus, 10, 10.5; tibia, 18, 91; foot, 9, 9.8.

Bonhote has recently described *M. fuscus* from the Loo Choo Islands, but this bat belongs to the group of smaller eastern *Miniopteri*, and is of a uniform sooty brown to the bases of the hairs. Whether or not there is a representative of the smaller group in Japan, has not yet been ascertained. In Europe the larger group seems to be alone represented.

Miniopterus blepotis (TEMMINCK).

Vespertilio blepotis Temminck, Monogr. Mammalogie, 1835, vol. 2, p. 212, Pl. 53, Figs. 1, 2.

Miniopterus schreibersii Auct., part.; Dobson, Cat. Asiat. Chiropt., 1876, p. 160; Idem, Cat. Chiropt. Brit. Mus., 1878, p. 348.

Miniopterus blepotis Tomes, Proc. Zool. Soc. London, 1858, p. 121.

Temminck (Monogr. Mammalogie, 1835, vol. 2, p. 212) applied the name *Vespertilio blepotis* to specimens of *Miniopterus* "tués à Java, à Timor et à Amboine," and he considered Japanese specimens identical with these. He gives the measurements (here converted into millimeters) as: total length, 106.5; tail, 51.8; forearm, 46–48. Farther on he states that females are smaller, with forearm two to three lines shorter, but this statement probably refers to the smaller species that also occurs in Java. Of the latter Mr. Thomas Barbour has recently presented to the Museum three males and three females collected by him at Buitenzorg, Java. The larger species, however, he did not obtain on that island, although he found it on Amboina, considerably to the eastward, where a single adult female was captured in a limestone cave. This bat corresponds closely with the original description, and doubtless represents Temminck's *blepotis*. This name should stand for the large *Miniopterus* of Java and the islands to the eastward, and possibly west to the southeastern coasts of Asia, for a specimen from Amoy, China, in the mounted collection of the Museum, is externally identical with our individual from Amboina. This latter, an alcoholic, No. 6920, measures as follows: head and body, 53; tail, 55; ear, 13; tragus (inner margin), 5; forearm, 45.5; thumb, 5.8; 2d digit, metacarpal, 39; 3d digit, metacarpal, 40.5; 1st phalanx, 10; 2d phalanx and tip, 39; 4th digit, metacarpal, 38.5; 1st phalanx, 8.8; 2d phalanx and tip, 17.5; 5th digit, metacarpal, 35.2; 1st phalanx, 8.6; 2d phalanx and tip, 9; tibia, 17; foot, 7.5; calcareus, 16. The skull measures: greatest length, 16.2; basal length, 14; palatal length, 8.4; interorbital constriction, 3.7; zygomatic breadth, 9.5; mastoid breadth, 8.6;

breadth outside third upper molars, 7.3; mandible, 12.8; maxillary tooth row (exclusive of incisors), 6.7; mandibular tooth row (exclusive of incisors), 7.

Two skins from near Cape York, northern Australia, are almost identical in measurements with the alcoholic specimen of *M. blepotis*, though the tibiae are perhaps a millimeter or two longer. The fur of these specimens is a uniform color throughout, and is nearest Ridgway's seal brown, with, however, a little less of the reddish tint. Leche (Proc. Zool. Soc. London, 1884, p. 53) has recorded under the name *Miniopterus schreibersi blepotis*, some bats of this genus from South Australia, and points out a few characters in which he found them to differ from the European species. The forearm measurement he gives as 45 mm.; that of our two Australian skins is 46 and 46.3 mm. respectively, which is practically that of *M. blepotis* of Amboina. For the present, then, the larger *Miniopterus* of Australia may be considered as this latter species.

Miniopterus blepotis differs notably from the large *Miniopterus* of India in its smaller size and the lesser inflation of the anterior portion of the braincase. Although no skins are available for comparison, the color of *M. blepotis* is said to be darker than that of *M. schreibersii*.

Miniopterus, sp.

A large *Miniopterus* from Queensland, in the mounted collection of the Museum, may be a different species from the large form of the east Asian mainland. Its color, which shows no evidence of fading through exposure in the exhibition case, is a dark seal brown above, slightly paler below. The hair is of the same color from tip to base. Ventrally the fur extends upon the wing membrane as far as a line joining the elbow and the knee. No name seems to be applicable to this bat, should it prove distinct, but in the absence of comparable material I prefer not to name it. The following measurements are from the skin as mounted: forearm, 50; 3d digit, metacarpal, 45; 1st phalanx, 11; 2d phalanx and tip, 37.5; 4th digit, metacarpal, 42; 1st phalanx, 9; 5th digit, metacarpal, 38; 1st phalanx, 13; foot, 9.5.

Miniopterus pusillus DOBSON.

Vespertilio blepotis Temminck, Monogr. Mammalogie, 1835, vol. 2, p. 212 (part).

Miniopterus australis Tomes, Proc. Zool. Soc. London, 1858, p. 125 (part).

Miniopterus australis Dobson, Journ. Asiat. Soc. Bengal, 1871, vol. 40, p. 265.

Miniopterus pusillus Dobson, Monogr. Asiat. Chiropt., 1876, p. 162; Cat. Chiropt.

Brit. Mus., 1878, p. 351; Bonhote, Novit. Zool., 1902, vol. 9, p. 626.

Among the bats collected by Mr. Thomas Barbour at Buitenzorg, Java, are six specimens of the smaller *Miniopterus* in alcohol. Temminck, in describing the Javan *M. blepotis*, speaks of smaller specimens which he supposes to have been females of the latter. Dobson later described and named the smaller bat, and in his Monograph of the Asiatic Chiroptera, records specimens from the Nicobar

Islands and from Madras, India. Tomes had previously included under *M. australis* small bats of this genus from "the Indian islands." Recent writers seem to have considered this species identical with the large *M. schreibersii*, although Bonhote refers to *M. pusillus* from the Nicobars as nearest in size to his *M. fuscus* from the Loo Choo Islands.

Our Javan specimens agree with Dobson's description of *M. pusillus*, the type locality of which may be considered the Nicobar Islands. The species is very well marked, with a small, light skull, and narrow rostrum. The sagittal crest is low and ill defined. The external ear is very small, not exceeding the fur of the crown. The following measurements are from the Buitenzorg series:

MEASUREMENTS OF MINIOPTERUS PUSILLUS.

No.	Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Foot.	Calcar.	Ear.
6914	51.0	50.0	43.0	6.5	81.5	51.5	17.5	8.0	17.0	9.0
6915	49.0	50.0	42.5	6.5	83.0	54.5	17.0	7.0	16.5	9.0
6916	48.0	50.0	42.0	5.5	81.0	52.0	17.0	6.0	18.5	9.0
6917	48.5	48.0	42.8	6.7	82.5	50.0	16.7	8.0	18.0	10.5
6918	49.0	48.5	42.8	6.0	83.0	52.8	17.5	7.7	—	9.5
6919	45.0	49.5	42.5	6.8	81.0	51.5	17.0	7.0	16.0	9.5

The skull of No. 6919 measures: greatest length, 13.7; basal length, 11.7; palatal length, 6.1; interorbital constriction, 4; zygomatic breadth, 7.6; mastoid breadth, 7.8; mandible, 10.2; maxillary tooth row (exclusive of incisors), 5; mandibular tooth row (exclusive of incisors), 5.

It is probable that Tomes's name *tibialis*, based on a small *Miniopterus* from Amboina, should replace *pusillus* of Dobson on ground of priority. Tomes states that this bat differs from what he considered *blepotis*, "in having the extremity of the tibia perfectly free for nearly a third of its length." This peculiarity, as indeed Tomes himself suggests, is probably due to shrinkage of the membranes in the preservative fluid. Without specimens for comparison, however, it seems better to use the name *pusillus* for the small *Miniopterus* of the East Indies.

Miniopterus australis TOMES.

Miniopterus australis Tomes, Proc. Zool. Soc. London, 1858, p. 125.

Two specimens of a small *Miniopterus* in the collection, labelled "Queensland (?)," agree in their dimensions with those given by Tomes for his Australian

species. It is the smallest of the eastern species hitherto recognized, and, according to Tomes, is "very similar" in color to *M. blepotis*, but usually with "a more decided rufous tinge," owing to the reddish tips to the hairs. The measurements of our two specimens follow; they are No. 6764, adult female, and No. 6765, adult male, and their respective dimensions are in each case given in this order: head and body, 45, 47.5; tail, 44, 46; forearm, 40, 38.5; thumb, 4.8, 4; 3d digit, metacarpal, 35, 34; 1st phalanx, 8.7, 9.8; 2d phalanx and tip, 31, 31.5; 4th digit, metacarpal, 34, 33.3; 1st phalanx, 7.5, 7.5; 2d phalanx and tip, 15.5, 15.6; 5th digit, metacarpal, 31.5, 31; 1st phalanx, 7.3, 7.5; 2d phalanx and tip, 8, 8.5; tibia, 15.6, 14.7; foot, 7, 7; ear, 9.2, 10. The skull of No. 6764 measures: greatest length, 14; basal length, 12; palatal length, 6.6; interorbital constriction, 3.7; zygomatic breadth, 7.6; mastoid breadth, 7.8; mandible, 10.5; maxillary tooth row (exclusive of incisors), 5.4; mandibular tooth row (exclusive of incisors), 5.8. The rostrum is slightly longer and the braincase smaller and less inflated than in *M. pusillus*, which it nearest approaches in size.

***Murina hilgendorfi* (PETERS).**

Among the Japanese bats presented by Mr. Thomas Barbour is an alcoholic male of this species, collected on Mt. Fuji, Japan, December 14, 1906. The type specimen came from Yedo, and is well figured and described by Peters (Monatsber. königl. preuss. Akad. Berlin, 1880, p. 24, plate), but I have found no record of the discovery of other specimens. The measurements of our specimen, No. 6924, follow, and in some cases are accompanied by the corresponding dimensions given by Peters for the type: head and body, 54; tail, 41; forearm, 43 (41); thumb, 12; 2d digit, metacarpal, 36 (34.5); 1st phalanx, 4.5 (4); 3d digit, metacarpal, 40 (38); 1st phalanx, 17 (18); 2d phalanx, 15 (15); 3d phalanx (cartilage), 7.6 (8.5); 4th digit, metacarpal, 37.5 (36); 1st phalanx, 14 (14); 2d phalanx and tip, 12.5 (13.5); 5th digit, metacarpal, 37.5 (37); 1st phalanx, 14 (13.5); 2d phalanx and tip, 13 (12); tibia, 17.8 (17); foot, 8.5; calcar, 13.5 (14); ear, 17.5 (17); tragus, 7.8 (10). The skull measures: greatest length, 20; basal length, 16.2; palatal length, 10.5; interorbital constriction, 5; zygomatic breadth, 11.5; mastoid breadth, 10; mandible, 14; maxillary tooth row (exclusive of incisors), 6.5; mandibular tooth row (exclusive of incisors), 7.

The fur is thick and woolly, and appears to be like that of Peters's specimen, — bright brownish above, and gray-white tipped, with dark bases below.

***Kerivoula hardwickii* (HORSFIELD).**

A single specimen was obtained by Mr. Thomas Barbour at Buitenzorg, Java.

MOLOSSIDAE.

***Chaerephon plicatus* (BUCHANAN).**

Mr. Thomas Barbour obtained a fine series, including both sexes, from Buitenzorg, Java. It is a house bat, often found in the interstices of buildings. One

specimen, No. 6844, has but two, instead of the usual four, lower incisors. This bat is closely related to the species described by Miller as *jobensis*, from the island of Jobie, northwestern New Guinea, if, indeed, the two are not identical. I have seen no specimens from Bengal, the type locality of *C. plicatus*; but Miller supposes the Indian animal to be larger, as "both Dobson and Blanford give the length of forearm in *N. [= Chaerephon] plicatus* as 50 mm. (1.95 in.), while in the six *N. jobensis* it ranges from 44 mm. to 46 mm." (Proc. Biol. Soc. Washington, 1902, vol. 15, p. 246.) In our Javan series the forearm measurement varies between 44 and 49 mm.

Molossops planirostris PETERS.

A skin and skull from near Panama are in the collection, thus establishing the presence of this species within the limits of Middle America. This is the specimen recorded previously as *Promops nanus* (Bull. Mus. Comp. Zool., 1906, vol. 46, p. 212), a mistake for which I am largely responsible. A comparison with material kindly loaned by the U. S. National Museum, however, leaves no doubt as to the identity.

Nyctinomus brasiliensis I. GEOFFROY.

The collection contains a large series of *Nyctinomus*, both skins and alcoholics, from Texas and Mexico, as well as other spirit specimens from Buenos Ayres and Patagonia. I am unable to discover tangible differences between the alcoholic specimens from the two extremes of the range, and hence follow Miller and Rehn (Proc. Boston Soc. Nat. Hist., 1901, vol. 30, p. 271) in applying Geoffroy's name to the Mexican and Texan bat, rather than that of Saussure (*mexicanus*) employed by Elliot. The following measurements are of Argentine and Texan specimens:

MEASUREMENTS OF NYCTINOMUS BRASILIENSIS.

No.	Locality.	Fore-arm.	Third Digit.	Fifth Digit.	Tibia.	Skull Length.	Zygom. Breadth.	Mandible.
1203	Buenos Ayres	42.7	82.0	44.7	10.7	17.0	10.0	12.0
3232	Patagonia, S. Matias Bay	41.0	75.5	42.2	10.6	16.6	9.5	11.8
3235	Patagonia, S. Matias Bay	41.6	72.5	40.5	10.7	17.0	—	12.0
6037	Texas	44.0	82.0	45.0	10.7	17.0	10.0	12.0
6040	Texas	42.4	80.5	42.3	10.5	16.8	10.0	11.5

The slightly shorter fingers of the Patagonian bats may be due in part to age, as the specimens seem not fully adult, and in part to their hard and shrunken con-

dition in the preservative fluid. Their skulls are similar to those from Buenos Ayres, Mexico, and Texas. The minute anterior upper premolar varies considerably in shape in different individuals; in some it is a terete spicule, in others the base may be markedly broader. Among twenty-eight specimens from Texas, seven lack the third lower incisor, while in three others that of the right hand side is gone. In three other cases it is the third incisor of the left hand side that is missing. In these individuals there may be a space between the second lower incisor and the canine, as if the third incisor had been shed, or the second incisor may be in close contact with the canine. In one (No. 6057) the third incisor is present on both sides, but is a very minute rounded spicule, to be with difficulty seen by the aid of a lens.

Nyctinomus brasiliensis cynocephalus (LE CONTE).

The *Nyctinomus* of Florida, as pointed out by Miller (Proc. Boston Soc. Nat. Hist., 1898, vol. 28, p. 218), differs from that of Texas and Mexico in its uniformly darker coloration. The back "is intermediate between the 'seal brown' and 'mummy brown' of Ridgway, but nearer the former," while the ventral surface is slightly paler. The hairs are hardly paler at the bases. A series of skins from Texas is distinctly of a lighter tint than the specimens from Florida, with the bases of the hairs grayish, especially about the nape and shoulders. A specimen from Gibson, Ga., is of a reddish tint and much paler than the series of skins from Florida. The latter can hardly be considered more than subspecifically distinct from *N. brasiliensis* of Texas and Mexico.

Nyctinomus antillarum MILLER.

The collection contains three alcoholics from St. Kitts, West Indies (included by Miller in the range of the species), and three from St. Bartholomew's Island. In the original description, the forearm of the type is given as 47.4, an obvious misprint for 37.4. Below are the measurements of two specimens (Nos. 6019, 6020) from St. Kitts, and two from St. Bartholomew's Island (Nos. 6023, 6024).

MEASUREMENTS OF NYCTINOMUS ANTILLULARUM.

No.	Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fourth Digit.	Fifth Digit.	Tibia.	Foot.	Ear.
6019	54	34.0	38.0	7.5	69.0	58.5	41.0	10.6	6.3	16
6020	53	29.5	36.5	7.0	66.5	56.0	39.0	10.2	6.0	16
6023	52	31.0	39.5	7.0	73.0	61.0	42.0	10.0	6.7	16
6024	52	33.0	39.0	7.0	73.0	61.0	41.5	10.5	6.5	15

Of the specimens from St. Kitts, two lack the third lower incisor on both sides, and one has lost that of the left side. The upper anterior premolar is so minute that except in one of the bats from St. Bartholomew's it cannot be seen until it is uncovered by scraping away the gums.

Molossus obscurus E. GEOFFROY.

There still exists some confusion regarding the identity of Geoffroy's *M. obscurus* and its relationship with other closely allied forms. The original description reads as follows: "Pelage brun-noirâtre en dessus, obscur en dessous; les poils étant blanches à leur origine. . . . Le poil n'est brun qu'à sa pointe; en quoi elle diffère principalement des deux précédentes [*M. rufus*, *M. ater*] qui ont leurs poils d'une seule couleur. Longueur du corps, 0^m, 060 (2 p. 2 lig.); — de la queue, 0^m, 030 (1 p. 1 lig.); — de la membrane interf. 0^m, 023 (8 lig.)." This was one of four species described by Geoffroy from actual specimens in the Paris museum, while the five other species named in the same paper, are based wholly on Azara's descriptions of Paraguayan bats. Geoffroy states that the specimens from which he describes his four first species are from "l'Amérique du nord, de Surinam, et principalement de Caënnue;" he further adds, under *Molossus obscurus*: "Je rapporte à cette espèce la petite chauve-souris obscure, ou la 9^e chauve-souris de M. d'Azzara." The type locality of *M. obscurus* has currently been accepted as Paraguay, where Azara's work was done. A reference to the latter's description, however, makes it clear that his ninth bat (Essais sur l'Hist. Nat. des Quadr. de Paraguay, 1801, vol. 2, p. 288), or "petite chauve-souris obscure" was a *Nyctinomus*, since "la lèvre supérieure a des plis verticaux" and "les canines, les incisives, et les molaires, sont comme dans la Chauve-souris huitième," identified by Thomas (Ann. Mag. Nat. Hist., 1901, ser. 7, vol. 8, p. 441) as *Nyctinomus laticaudatus*. Of this species Azara says the upper incisors are "avec une séparation," whereas in *Molossus* they are so closely approximated medially that Azara was misled into supposing that his tenth bat, *Molossus crassicaudatus*, had in the upper jaw "deux canines avec une seule incisive au milieu." Temminck, who examined Geoffroy's type specimen, recognized that it was *not* Azara's ninth bat, and added that "M. Desmarest partage mon opinion" (Monogr. de Mammalogie, 1827, vol. 1, p. 236 and footnote); his description of *M. obscurus* was based on individuals from Surinam, and he mentions that he had seen others from Brazil. The type locality of *M. obscurus* is therefore probably Surinam (one of the localities mentioned by Geoffroy), not Paraguay. The Museum has a series of alcoholic specimens from various localities in northeastern Brazil that are thus practically topotypes, and these agree in measurements with a skin and skull from Goya, Argentina, kindly loaned by the U. S. National Museum. In this skin the hair above is a broccoli brown, paler at the base; and below, a lighter tint of the same. In alcoholic specimens the bases of the hairs are not so conspicuously light as in *M. crassicaudatus*. West Indian representatives of this species from Dominica and Sta. Lucia are a very little smaller than those from Brazil, but the material

at hand does not warrant their separation. Of the specimens whose measurements follow, the first is a skin, loaned by the U. S. National Museum.

MEASUREMENTS OF MOLOSSUS OBSCURUS.

No.	Locality.	Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Ear.
141,530	Argentina, Goya	"73"	"38.0"	41.3	8.0	79.3	45.0	11.8	"14.0"
3063	Brazil, ?Manaos	64	40.0	43.0	7.5	82.0	44.0	12.0	15.0
3936	Brazil, Obydos	63	43.0	42.0	6.8	80.0	42.0	11.5	14.0
4221	Brazil, ?Para	63	36.0	41.0	7.0	80.3	43.5	11.8	15.0
5148	Brazil, Santarem	60	37.0	40.0	7.3	78.5	43.0	11.0	13.5
3930	Brazil, Bahia	61	40.0	41.2	6.5	78.3	42.2	12.0	14.0
6026	W. I., Dominica	58	38.5	40.0	6.8	77.5	40.5	12.0	14.0
6027	W. I., Dominica	56	34.0	39.5	6.0	76.0	41.0	10.5	13.5
6948	W. I., Sta. Lucia	58	36.0	40.3	7.5	78.0	42.0	11.3	13.5
6949	W. I., Sta. Lucia	61	36.7	40.0	6.8	78.0	42.0	11.8	14.0

The skull of No. 3063, from Brazil, measures: greatest length, 19; basal length, 15; palatal length, 7; interorbital constriction, 4; zygomatic breadth, 11.2; mastoid breadth, 11; mandible, 13; maxillary tooth row (exclusive of incisors), 6.7; mandibular tooth row (exclusive of incisors), 7.5. The development of the sagittal crest is subject to considerable individual variation, and in some specimens is hardly noticeable. From the above measurements it is seen that Thomas's *M. obscurus currentium* from Goya, Argentina, is not different from what is here considered typical *obscurus* of eastern and northern South America. The range of this bat appears to be wide, but the status of the various local forms hitherto described seems as yet largely uncertain.

Molossus crassicaudatus E. GEOFFROY.

This is certainly a distinct species, and not a race of *M. obscurus* as hitherto supposed. The Museum collection contains specimens from Brazil, Ecuador, Panama, and the Lesser Antilles, and I have examined skins from the type locality, Paraguay. Its range seems nearly coextensive with that of *M. obscurus*. Thomas (Ann. Mag. Nat. Hist., 1901, ser. 7, vol. 8, p. 437) restricted the name *crassicaudatus* to the small *Molossus* of Paraguay and northern Argentine, and

considered it identical with the tenth bat listed by Azara from Argentine, notwithstanding that Geoffroy, in applying the name, gave it to a bat *larger* than his *M. obscurus*. It is not unlikely that *M. obscurus* should rightly refer to this smallest species of the genus, as its forearm corresponds closely in length to the dimension given by Temminck (1 inch, 5 lines), although he may have confused the two. However, as the original descriptions of both species contain nothing that is clearly diagnostic, and as the length of head and body (60 mm.) given by Geoffroy for his *M. obscurus* is obviously more nearly that of the bat that I have referred above to that species, I follow Thomas in the use of the name *crassicaudatus* for the smallest species (forearm, 36-39). Specimens from Villa Rica

MEASUREMENTS OF MOLOSSUS CRASSICAUDATUS.

No.	Locality.	Head and Body.	Tail.	Fore-arm.	Thumb.	Third Digit.	Fifth Digit.	Tibia.	Ear.
114,905	Paraguay, Paraguari	—	"38.0"	37.8	7.0	75	41.0	—	—
114,907	Paraguay, Villa Rica	—	"35.0"	37.6	7.0	77	41.5	11.0	—
3238	Brazil, San Paulo	49	30.5	36.5	5.0	70	36.5	10.0	10.0
3240	Brazil, San Paulo	55	35.0	37.0	6.2	72	39.0	10.8	12.0
3241	Brazil, San Paulo	54	33.6	37.8	5.5	73	38.0	11.5	12.0
3242	Brazil, San Paulo	52	36.0	37.5	5.5	74	38.5	10.8	12.0
6025	W. I., Dominica	52	33.0	36.5	6.5	72	37.0	10.5	12.0
6099	Ecuador, Guayaquil	53	32.0	35.3	6.3	69	36.5	10.2	12.0
6759	Panama, San Pablo	54	30.0	37.0	6.5	72	38.5	10.3	11.5
6760	Panama, San Pablo	53	32.0	37.0	6.0	72	38.5	10.5	11.7

and Paraguari, Paraguay, loaned me by the U. S. National Museum are very differently colored from skins of *M. obscurus*. They are nearly seal-brown, with the basal half of the hairs sharply grayish-white, on both surfaces. Specimens from St. Vincent and Sta. Lucia, Lesser Antilles, are somewhat darker, but this difference is probably due in part to the method of making up the skin. All agree in having a peculiar gloss to the fur, characteristic of certain other species of the Molossidae. Although the forearm measurement is nearly as great as that of *M. obscurus*, the present species is of strikingly smaller bulk, and the long grayish bases to the hairs, especially of the shoulders and chest, give alcoholic specimens a quite different appearance. The skull is smaller than that of *M. obscurus*, and the sagittal crest is weakly developed, usually only a slight ridge.

Two specimens, skinned out from alcohol, seem to be this species, and were collected on Margarita Island, Venezuela. They have quite lost the rich gloss seen in fresh skins. Of the specimens whose dimensions are given, the first and second are skins kindly loaned by the U. S. National Museum, and the remainder are alcoholies in the collection of the Museum of Comparative Zoölogy.

Following are the measurements of a skull from Paraguay, No. 114,906, U. S. Nat. Mus., and, in parentheses, of one from San Pablo, Panama, No. 6759: greatest length, 17 (16); basal length, 14 (12.7); palatal length, 6.4 (6); interorbital constriction, 3.7 (3.6); zygomatic breadth, 10.5 (10.2); mastoid breadth, 10.3 (9.6); mandible, 12.1 (11.1); maxillary tooth row (exclusive of incisors), 6 (5.8); mandibular tooth row (exclusive of incisors), 7 (6.5).

EXPLANATION OF PLATE.

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- FIG. 1. *Pteropus ariel*, dorsal view of skull of type, No. 10,565, Museum of Comparative Zoölogy, from Male Atoll, Maldivé Archipelago. Natural size.
- FIG. 2. *Pteropus giganteus*, dorsal view of skull, No. 5169, from Koolloo Valley, India. Natural size.
- FIG. 3. *Pteropus ariel*, dorsal view of rostrum of an immature individual, No. 10,566, showing the shape of the nasals. Natural size.
- FIG. 4. *Pteropus giganteus*, dorsal view of rostrum of an immature individual, No. 5175, from Koolloo Valley, India, to show the elongated nasals. Natural size.
- FIG. 5. *Plecotus auritus*, thumb of an European specimen. Natural size.
- FIG. 6. *Plecotus sacrimontis*, thumb of the type, No. 6932, Museum of Comparative Zoölogy, from Mt. Fuji, Japan. Natural size.
- FIG. 7. *Lonchophylla hesperia*, anterior view of chin, showing enlarged terminal papillae bordering the labial groove. Zorritos, Peru. Enlarged about five times.

